Investigating 19th-Century Mathematical Journals : Importance and Use of Other Periodicals in Nouvelles Annales de Mathématiques from1842 to 1870

Liliane Alfonsi

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Liliane ALFONSI[1]

The topic of this communication is to investigate the importance and the use of others journals, by the different editors of *Nouvelles Annales*, from its creation in 1842 to 1870.

I wish to make it clear that what I mean by "other journals" is any regular scientific publication with mathematical articles, such as mathematical journals (*Crelle*, *Liouville*, etc..) but also academic publications (memoirs compilation or proceedings of an academy).

To understand the use of other journals in *Nouvelles Annales*, it is important to know that *Nouvelles Annales* is a journal for youngsters aiming to the Polytechnique and Normale schools.

•This is the first page in 1842, which points out the complete title and aim of journal as well as the editors:

NOUVELLES ANNALES
DE
MATHÉMATIQUES
JOURNAL DES CANDIDATS
AUX ÉCOLES POLYTECHNIQUE ET NORMALE
Rédigé par MM.
Terquem
Officier de l'Université, Docteur es sciences, Professeur aux Écoles Royales d'Artillerie
et
Gérono
Professeur de Mathématiques

It's not a journal for mathematical researchers, it's a journal for students and professors who are concerned by these schools and, more generally, for any people who have an interest for this level of mathematics.

Terquem and Gerono created it in 1842, but, as we see on the first page of the journal, Terquem seems to be the most important editor. *Nouvelles Annales* is his own journal and, as we will see, he uses it to serve his own goals and his own vision of what the teaching should be in high-level schools.

From 1842 to 1870, the editorial staffs were:

- 1842 creation, editors TERQUEM and Gérono

1862: the death of Terquem

- 1863: editors Gérono and Prouhet

1867: the death of Prouhet

- 1868: editors Gérono and Bourget

I would now like to explain what my method was.

[1] Laboratoire GHDSO. Université Paris-Sud

At the beginning, I looked at the volumes from 1842 to 1870, from page to page, noting all occurrences of other journals and trying to determine the most important years for my study.

After this first glance, it appeared to me that I had to focus on:

1842, 43, 44 because these are the first years of the journal

1848 because it is the year of a revolution (against the king), which had an influence on École Polytechnique because École Polytechnique students were essentially republicans and because it was in that year, that studies became free at this school.

1850, 51, 52, 53, 54 because there was a very important program change in November 1850, and Terquem vigorously fought against this change, as we will see, using foreign journals till 1854.

1855 Terquem acknowledges himself beaten, and fought in another way.

1863, 64, 65, it is Prouhet's beginning as editor and a great change for *Nouvelles Annales* and the use of other journals

1868, 1869, 70, it is the same thing for Bourget.

For all of these years, I noted for all occurrences, the journal, the author, the subject and the nature of occurrence:

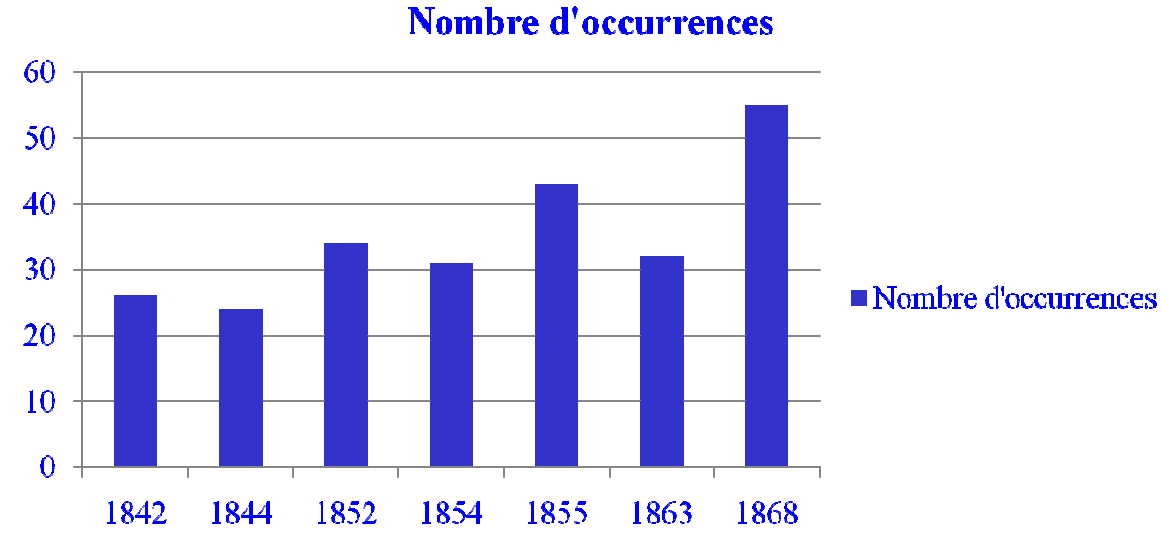
- either a full article of another journal
- or an extract or a revised version of the article
- or an *Nouvelles Annales* article based on another journal's article (contestation, prolongation…)
- or a summary
- or claims of order of priority
- or questions asked / answers given
- or cited reference points and works used
- or miscellaneous.

After this work, what were the quantitative and qualitative results?

I. Quantitative results

The first quantitative results are the number of occurrences for every year pointed out.

Years	1842	1844	1852	1854	1855	1863	1868
Number of occurences	26	24	34	31	43	32	55

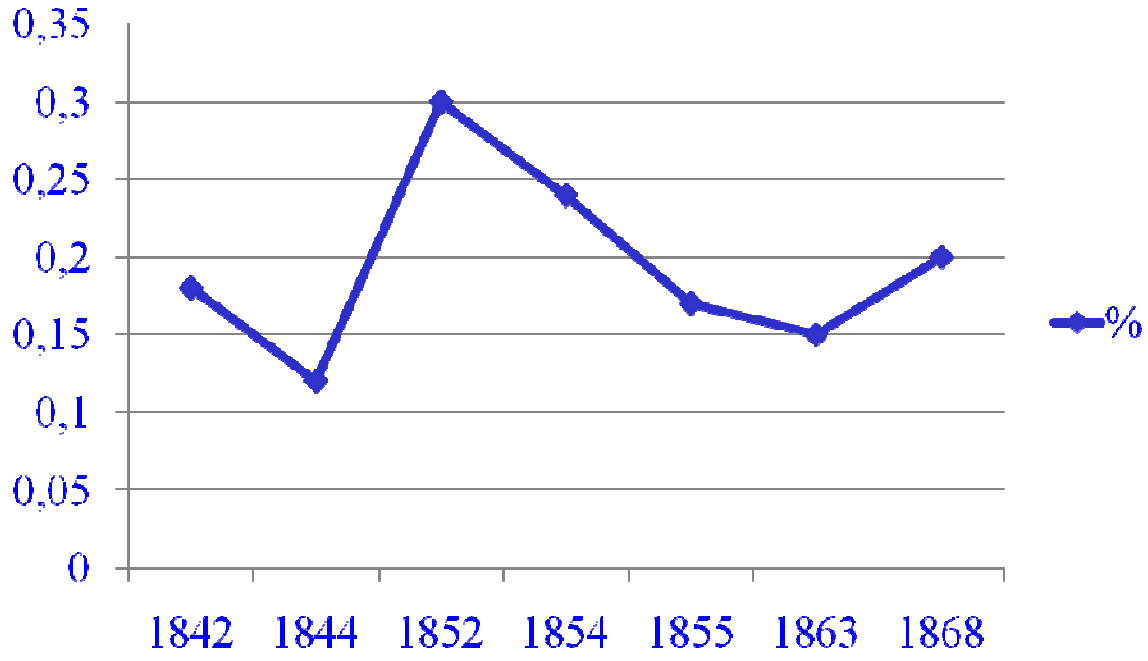


I only put on the graph significant years. We see that occurrences rise from 26 to 55 and that there is a regular progression with Terquem.
There is a peak in 1855 which has a lot of reasons, among these, the creation of a new part of *Nouvelles Annales*: The *Bulletin de Bibliographie, d'Histoire et de Biographie Mathématiques*.

Despite the peak in 1868 with Bourget's beginning as editor, it's not true that other journals had a more important role in *Nouvelles Annales*, in 1868 than in 1855.
We see that point now with another graph, knowing that an article from another journal (**f another J**) is a *Nouvelles Annales* (**NA**) article made of
- either a full article
- or selected passages
- or summary
- or analysis
- or in reference to

an article published in another journal or in academic publications.

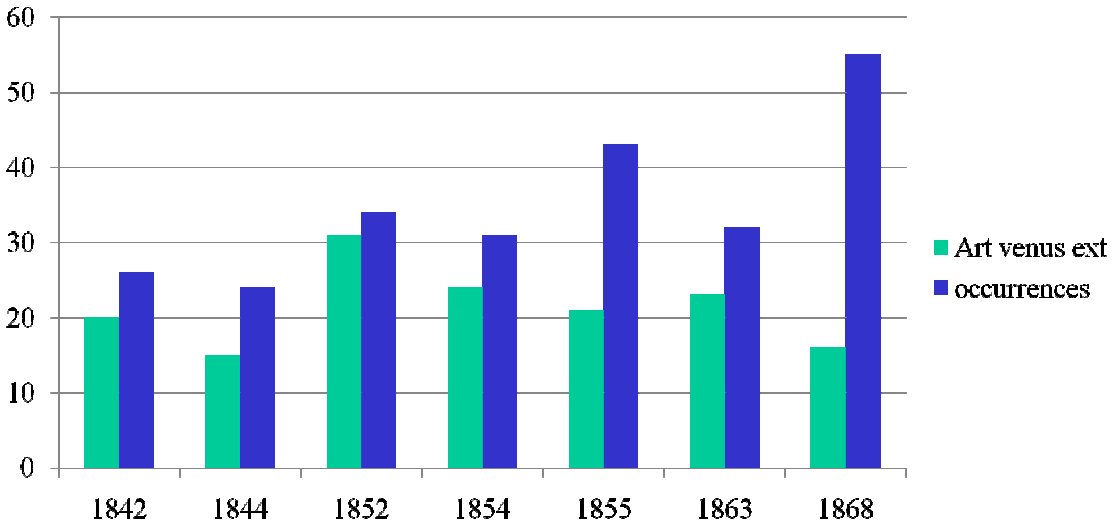
years	**1842**	**1844**	**1852**	**1854**	**1855**	**1863**	**1868**
f another J	20	15	31	24	21	23	16
Total **NA** articles	113	129	103	150	121	149	79
%	18	12	30	24	17	15	20



Here we have the curve of the percentage of foreign articles in the *Nouvelles Annales*.
We can see that it is in 1852 with Terquem, that there are the most foreign articles in *Nouvelles Annales* whereas Bourget (1868) who had the most occurrences appearing, had far less foreign articles.
There is a trough in 1863 when Prouhet arrives and a peak in 1852 with Terquem's fight against the programs.

Another graph shows that with Terquem, occurrences are most of all, articles from other journals, except from 1855, because Terquem changes his mind and acknowledges himself beaten.

years	1842	1844	1852	1854	1855	1863	1868
f another J	20	15	31	24	21	23	16
occurrences	26	24	34	31	43	32	55



The most remarkable thing is the last diagram: With Bourget, in 1868, there is a peak of occurrences but a trough of articles from other journals because most of occurrences are footnotes reference points, questions, etc.

II. Qualitative results

For a qualitative study, I took, for every year, the five journals that have the greatest number of quotations.
With Terquem it's *Crelle Journal*, a German Journal very important for researchers that is number one. This is a proof of the use by Terquem of other journals in *Nouvelles Annales*: he tries, with researcher's journals, to raise the level of teaching mathematics in the higher French schools.
With Prouhet in 1863, Italian journals arrive first: the journal of Institute of Bologna and the *Annali delle scienze mathematiche.*
And with Bourget, in 1868, *Nouvelles Annales* sticks more closely to the Polytechnique and Normale schools' program and there are more old journals and French journals: the *Mémoires de l'Académie des sciences de Paris* and the *Annales de Gergonne*, a French journal which is over from 1854.

1842	Acad Berlin	Acad Paris	Crelle	Gergonne	Journal X
number	4	3	3	7	4

1854	Arch Math Grunert	Camb&Dublin	Crelle	Gergonne	Liouville
number	4	3	7	2	4

1855	Acad Paris	Ann sc math	Astro nachrich	Crelle	Liouville
number	**9**	2	2	**10**	4

1863	Acad Paris	Ann sc math	Crelle	Instit Bologne	Liouville
number	2	**4**	2	**5**	2

1868	Acad Berlin	Acad Paris	Bull stor M&P	Gergonne	Liouville
number	4	**8**	4	**6**	5

III. The use of others journals by the different editors of *Nouvelles Annales*

Now I will try to show the use of other journals by the different editors and I begin with Terquem.

1- Terquem (1842-1862)

As we can see in the first example below, articles are clearly noted as being from another journal (here *Crelle's journal*, 1835), in the beginning of the text, the author (here Jacobi) is named at the same time.

DE L'ÉLIMINATION DE LA VARIABLE

entre deux équations algébriques.

Par C. G. J. JACOBI, professeur à Kœnigsberg. (Crelle, XV, 101, 1835, latin.)

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1.

Entre les diverses méthodes d'élimination qui ont été proposées, il en est une que je me rappelle avoir lue jadis dans les ouvrages élémentaires composés par le célèbre Bezout, et qui se distingue avantageusement des autres à divers titres. Mon but est d'exposer brièvement cette méthode et d'y ajouter diverses observations (*).

Nous pouvons supposer que les deux équations sont de même ordre; car si l'une des équations est d'un ordre inférieur à l'autre, il suffira d'égaler à 0 les coefficients des puissances manquantes. Soient donc ces équations :

$$f(x) = a_n x^n + a_{n-1} x^{n-1} + a_{n-2} x^{n-2} \ldots + a_o = 0,$$
$$\varphi(x) = b_n x^n + b_{n-1} x^{n-1} + b_{n-2} x^{n-2} \ldots + b_o = 0.$$

(*) Les auteurs du programme d'admission à l'École polytechnique n'ont pas eu la main heureuse en choisissant parmi les méthodes d'élimination celle du p. g. c. d ; la plus mauvaise, et tellement longue, qu'on a été obligé de *proscrire* la partie essentielle, la discussion des facteurs étrangers. Ce programme aurait besoin d'être totalement remanié, car il domine et entrave l'enseignement.

It's an opportunity for Terquem to give his advice on Polytechnique program and to criticize it in a footnote.

Terquem also gives often his advice in long commentaries after an article, as we can see in this second example. After a Salmon's article in *Cambridge & Dublin Mathematical Journal*

(1848), in which Salmon says that English students learn cono-spheric curves, Terquem hardly criticizes the higher schools' programs in France:

> « Teaching in France, has been made throughout the year on the basis of conics which nevertheless remain cono-spheric cases, because the plane constitutes a particular case of a sphere. The fact that these curves are not mentioned in colleges is a pity; ***but that they are not even mentioned in the higher schools such as the École Normale and the École Polytechnique, is totally unacceptable.***
>
> ***To the credit of German and English universities, these curves are commonly taught which is perfectly right.*** »

His criticism on the Polytechnique program, about conics, is very strong and he doesn't mince his words.

Terquem uses also articles of foreign journals as an educative tribune and to criticize French teaching.

Giving a summary of the Dublin calendar for 1850, he writes:

> « I read with great interest a report on Oxford University […] It finished with remarkable conclusions that would be of a great interest in France, when the French government will be able to do other things than an arms' factory, sometimes in favour of, sometimes against University and when the principal goal will be education and not hierarchical trivial rewards. ***These questions show what is the state of teaching and enable us to make comparisons that, for mathematics, as I can see, aren't to our advantage. Overseas, there is a spirit of progress : teaching follows science. In France, there is a stationary spirit, often, retrograde spirit.*** »

He uses caustic humour to criticize teaching choices for the Polytechnique program, always starting from other journals:

In 1850,

> « In *M. Crelle's Journal* (t. XL, 2) there are three articles on number theory, by M. E.-E. Kummer, a famous professor at Breslau University. M. Crelle has acquired eternal rights to the mathematicians' gratefulness for having published tremendous works on this most noble, generous and sublime part of mathematical science. (<u>See the note at the end</u>)
>
> <u>*Note*</u>. ***The number theory is very little known and even disdained in France and for good reasons. This theory doesn't make wheels turn round, watergates open, gas condense and, worse than all that, isn't used in examinations; because of these reasons, calculating persons, in a majority position, ask why there is any need to study a theory which doesn't bring anything.*** My stubborn intelligence doesn't give me any answers to such questions. ***Rumour has it, by the same calculating mind that the next program for the École Polytechnique will throw away rational mechanics by Lagrange, Laplace, Poisson, and will put in place industrial mechanics.*** As I believe in decency, I don't believe in this news: there is some misunderstanding. »

And in 1851, concerning Hess's article in Crelle's Journal:

> « Determinants (Cramerian functions) today rule over all mathematics. So, I suppose, it's a right thing that they have been taken away from the new program. They have been replaced by the auxiliary plane, logarithm, elementary work which have taken fruitfully their place; lovely triad, without forgetting Saint Gunther's ruler that every mathematician needs to have all the time in his pocket or in his hands. »

With the same humour, he also strongly criticizes Le Verrier, the most important responsible of the Polytechnique program, for his choices, in contradiction with his own work, starting from the *Connaissance des temps*, which is a publication of French Institute:

> « In the Connaissance des Temps for 1849, there is, in a Le Verrier's report on Uranus planet, lots of linear equation systems with four unknowns; exercises of the day, taken from good authority. ***At page 169, he uses determinants. That's what we shouldn't copy. Because we have removed these***

formulae from the Education program; but how would this illustrious mathematician have used them if they hadn't been taught to him?

(*) The famous mathematician astronomer used the Sturm theorem judiciously; An academician of the same name has taken away from the education program this theorem as belonging to high-level theory, useless thing; A representative of the same name has declared a high theory to be an indispensable thing. Do these three names designate the same person? O. TERQUEM. »

After an article from M. Jacobi, (*Crelle's Journal*, t. XXX, p. 51-94; 1846) concerning a particular system of first degree equations Terquem wrote (1851):

« Astronomic application: The aim of the present report is not purely analytical. The illustrious author offered to put forward a simple process to solve numerically the equations present in the theory of the secular perturbations of the planets. ***The numeric data are taken from the remarkable work of Le Verrier on the same subject. The compared results show that the Jacobi process is far more exact than the one Le Verrier used***. ***Due to the dire lack of a journal of Astronomy, M. Liouville would fill the gap, as far as he could, to such a shameful lack for the country by inserting in extenso the report of the illustrious Prussian*** and other analogous works in his precious journal also destined to applied mathematics. »

After this vigorous fight, Terquem in 1855 acknowledges himself beaten. He doesn't think that the *Nouvelles Annales* hadn't followed sufficiently the Polytechnique program but that it was the official program, which hadn't given sufficient attention to the *Nouvelles Annales* and their ideas. That what he writes in the editorial of 1855:

« The *Nouvelles Annales de Mathématiques* are entering their fourteenth year and despite the sacrifices we have often imposed ourselves, ***they haven't yet, we have to admit, been able to give us a just remuneration***. Would they have missed the goal pursued, to offer youngsters aiming to the Ecoles Polytechnique and Normale the solutions to problems that can interest them most? We think not. In fact, the *Annales* have dealt with the beautiful and difficult questions of passed exams, and also ***the questions of the new exams, when they presented some interest***. There was given numerical calculus exercises, logarithms with a scope that are to be found nowhere else. ***Despite the narrow position given to the Nouvelles Annales by the official programs,*** we shall as from January 1855 make new efforts in the interest of science. »

And he announces the creation of the *Bulletin de Bibliographie, d'Histoire et de Biographie mathématiques* where he will put from now on, the most parts of articles of others journals:

« ***Each month there will include an added brochure with at least a pagination of its own under the title: Bulletin de Bibliographie, d'Histoire et de Biographie mathématiques, par M. O. Terquem***. The title of the brochure makes the object clear. The history of Science is that of the human mind […] All the dignity of Man is in the thought process. Mathematics are a perpetual thought process. May we be worthy of our new mission! »

2- Prouhet (1863-1867)

It is Prouhet's arrival, which gives a greater respect of programs.
He decides the end of the *Bulletin*, initiated by Terquem as we have seen before, and gives fewer articles of other journals but more quick summaries in biographical articles.
In fact, the *Nouvelles Annales* loose their great originality, due to Terquem, to become only a way to prepare seriously Polytechnique and Normale examinations.

The part "questions asked/answers given" takes more and more place in the journal, and when articles are chosen, they are articles which subject is part of the program examination.

For the articles of other journals, he takes only fragments and he rewrites them. He only puts as a footnote the sources of the articles, such as the author and the name of the journal,

whereas Terquem is more explicit on his sources and makes it perfectly clear where his articles are taken from.

We can see the difference between the two editors, looking at the first example of Terquem (article of Jacobi took in Crelle's journal) and at the example of Prouhet below:

SUR LE NOMBRE DES DIAGONALES D'UN POLYÈDRE (*).

Je désignerai par f le nombre des faces, par s le nombre des sommets et par a le nombre des arêtes du polyèdre. On sait qu'il existe entre ces trois quantités la relation

(1) $$f + s = a + 2$$

découverte par Euler.

(*) Ce problème a été traité par M. Henri Binder dans les *Archives* de Grunert, t. VIII, p. 221.

It is only in a footnote that we learn in which journal and from what author Prouhet took the article.

Prouhet stops definitively to use other journals with the aim to give advice and criticism on the programs.

3- Bourget (1868-1870 the end of our study)

This trend increases with Bourget as editor. He choices to put in the *Nouvelles Annales* still fewer articles of other journals and more historical articles than mathematical articles. The fact that an article is taken from another journal is much badly indicated as it was by Prouhet.

As an example which we can see below, we will know that « *Etude sur des surfaces algébriques* », is taken from the *Journal des savants* and who is the author, only at the end of the article and this is written in very small letters:

c'est-à-dire que par chaque point du plan il passe deux ovales se coupant à angle droit, dont l'étude a conduit récemment M. Darboux à une démonstration nouvelle et fort élégante du célèbre théorème d'Euler, sur l'addition des fonctions elliptiques. J. BERTRAND.

(Extrait du *Journal des Savants.*)

Bourget uses of other journals most of all in footnotes and used as reference points. He respects official programs and so the articles of *Nouvelles Annales* are, for the most, of the Polytechnique and Normale schools' level and made especially by authors who writes for the journal. *Nouvelles Annales* becomes a journal, which lives essentially in autarky.

IV. Conclusion of this study from 1842 to 1870.

For these years, the most important editor was Terquem who founded *Nouvelles Annales* in 1842. He wanted to use the journal for the aim of influence program examination of Polytechnique and Normale schools and, more generally, French teaching, in a sense of a higher level.

He took articles in researchers journals (*Crelle*, *Liouville*, etc.) that he put in *Nouvelles Annales* as full articles or long selected passages, by one hand to improve the level of students and teachers who buy his journal, and by another hand to write at the government and at the men responsible of mathematical French teaching what they have to do.

He took also articles on the history of mathematics to give examples to follow and a more general mathematic culture at youngsters.

For all articles, the author and the original journal are mentioned at the beginning and very clearly and Terquem used of their authority to serve his purpose and to give lessons at the ministry of French education and at his staff.

It is only in 1855 that he changed his mind, seeing that his journal was not very bought, because of the non-respect of the real program examination. So he took minus mathematical articles in researcher journals and more in books or revues of mathematical history, creating the *Bulletin de Bibliographie, d'Histoire et de Biographie mathématiques* in appendix of *Nouvelles Annales*.

His successors, Prouhet and Bourget, were more classical. They did not use many articles from researcher's journals, and the few they used were in footnotes or cited referenced points. Criticism of French teaching and of program examination, which was the principal aim of articles of others journals with Terquem, disappeared completely. And if the *Nouvelles Annales* became more sold, it loosed (from 1863 to 1870) his high mathematical and culture level, his function of mathematics teaching consciousness, and as Terquem said "his mission: « All the dignity of Man is in the thought process. Mathematics are a perpetual thought process. May we be worthy of our new mission! »